U.S. NUCLEAR REGULATORY COMMISSIOM

REGION I

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| Licensee: | Public Service Electric and Gas Company |
| Facility: | Hope Creek Generating Station |
| Location: | Hancocks Bridge, New Jersey |
| Dates: | February 24-28, 1997 |
| Inspectors: | J. Williams, Sr. Operations Engineer, Team Leader<br>C. Sisco, Operations Engineer<br>H. Lathrop, Resident Inspector<br>J. Wilcox, Sr. Operations Engineer, HQMB, NRR<br>M. Bugg, General Engineer, NRR<br>R. Travis, Contractor |
| Approved by: | Glenn W. Meyer, Chief<br>Operator Licensing and Human Performance Branch<br>Division of Reactor Safety |

## TABLE OF CONTENTS

PAGE

## EXECUTIVE SUMMARY

This inspection involved a review of Hope Creek's implementation of 10 CFR50.65, the maintenance rule. The report covers a one week on site inspection by regional and NRR inspectors during the week of February 24, 1997.

MAINTENANCE

- A number of systems, components and functions were not included in the maintenance rule program. This was an apparent violation of the rule.

- The team questioned the adequacy of operational procedures for the bypassed and inoperable status indication system, which was an unresolved item.

- The team concluded that the current expert panel was functioning well, however, a number of weaknesses were noted in the safety significance determinations made by an earlier panel. The decision to expand the role of the panel beyond that described in NUMARC 93-01 was a good initiative. Documentation of the bases for safety significance determinations was weak.

- The team concluded that the PSE&G approach to establishing SSC safety importance from the Level 1 PRA was acceptable. However, the team disagreed with five SSCs placed in the low safety significant category and judged the bases for these determinations to be insufficient. Shortcomings included initiating events and barriers to fission product release. These determinations disagreements represent an unresolved item.

- Where PSE&G had established an unavailability performance criteria for a SSC, the team concluded that the performance criteria were consistent with safety and satisfactory. However, the team found a large number of high safety significant and standby SSCs that did not have appropriate performance criteria. An apparent violation was identified for failure to establish adequate performance criteria.

- The team found that industry-wide operating experience had been incorporated into the maintenance program by the system managers when setting goals and performance criteria and monitoring performance.

- Six of the nine SSCs reviewed in detail by the team had problems in the areas of scoping, system boundary definition or establishing performance criteria. The team believes this indicated a weak program.

- The team found that PSE&G had procedures in place to effectively control on-line maintenance with respect to risk evaluation. There were several areas where enhancements could be made in their program, and PSE&G was found to be actively addressing these issues.

- The team concluded that the licensed senior reactor operators (SROs) thoroughly understood the use of their risk matrix guides and were aware that some systems and surveillances were not included. The team concluded that the SROs had an understanding of the maintenance rule and their responsibilities under the rule.

- The team concluded that the guidance developed by PSE&G should allow the facility to perform an acceptable periodic evaluation. Adequate guidance is also provided to balance reliability and availability of high safety significant SSCs.

- The potential impact of operating the 250 VDC battery systems at higher voltage than specified in the FSAR and the inconsistency of operation with the FSAR was identified as an unresolved item.

- System managers were knowledgeable of their assigned systems and demonstrated sufficient knowledge to effectively implement their responsibilities under the maintenance rule. They were effectively monitoring their systems in spite of the weaknesses in the performance criteria.

- The team concluded that PSE&G had conducted numerous maintenance rule program assessments and had addressed issues identified in the assessments. The latest assessment and associated action plan covers all aspects of the rule. The team concluded that when the actions are successfully completed the maintenance rule program at Hope Creek should be greatly enhanced. These actions will be inspected in a future inspection.

## Report Details

### M1 Conduct of Maintenance (62706)

#### M1.1 SSCs Included Within the Scope of the Rule (62706)

a. Inspection Scope

The team reviewed the scoping documentation to determine if the appropriate structures, systems and components (SSCs) were included within the maintenance rule program in accordance with 10 CFR 50.65(b). The team used NRC Inspection Procedure (IP) 62706, NUMARC 93-01, and Regulatory Guide 1.160 as references.

b. Observations and Findings

At Hope Creek, procedure SE.MR.HC.XX, "System Function Level Maintenance Rule Scoping vs. Risk Reference," Rev. 2, provided the listing of SSCs which were in the scope of the rule, their functions, and safety (risk) significance. Public Service Electric and Gas (PSE&G) reviewed 155 SSCs, included 96 SSCs under the maintenance rule, and identified 27 SSCs as high safety significant. The screening criteria used by PSE&G were consistent with NUMARC 93-01 guidance.

The team noted that PSE&G had recently identified additional SSCs for inclusion in the maintenance rule program. These SSCs were:

- plant computer
- process sampling
- main generator - gas control

The team reviewed FSAR Table 3.2-1 that listed the safety classification of SSCs at Hope Creek. From this review, the team identified additional SSCs that should have been included under the maintenance rule. These SSCs and the bases for inclusion were:

- nuclear fuel-safety related
- bypassed and inoperable status indicating system (BISIS)-safety related
- drywell ventilation system-emergency operating procedures (EOPs)
- essential lighting system-EOPs
- communications system-EOPs

In addition, the team identified functions of SSCs that should have been scoped into the maintenance rule program but were not. Examples and bases included:

- reactor auxiliary cooling system (RACs) function of cooling the control rod drive (CRD) pumps-failure could cause a scram.
- standby liquid control system function of providing water to maintain reactor level during certain emergency situations-used in the EOPs.
- condensate storage tank (CST)-support of safety related system and used in EOPs.

Failure of PSE&G to include these SSCs under the maintenance rule is an apparent violation of 10 CFR 50.65(b). **(VIO 50-354/97-80-01)**

During the team's review of the bypassed and inoperable status indication system (BISIS), the team determined that this system, important to safety, did not appear to have adequate operating procedures. PSE&G prepared Action Request (AR) 00470227208 to evaluate the adequacy of the operating procedures for BISIS. The adequacy of operating procedures for the system is an unresolved item. **(URI 50-354/96-80-02)**

c. Conclusions

The team concluded that the PSE&G review of SSCs for inclusion in the maintenance rule was not entirely successful. All required systems and functions were not included in the maintenance rule program and some SSCs had only recently been identified by PSE&G for inclusion in the maintenance rule program. A violation was identified in that important systems and functions were inappropriately excluded from the scope of the program.

The adequacy of procedures for the bypassed and inoperable status indication system was an unresolved item.

M1.2 Safety (Risk) Determination, Risk Ranking, and Expert Panel (62706)

a. Inspection Scope

Paragraph (a)(1) of the maintenance rule requires that SSC performance goals be established, commensurate with the safety significance of the SSC. Implementation of the maintenance rule using the guidance contained in NUMARC 93-01 requires that safety be taken into account in setting performance criteria and monitoring under paragraph (a)(2) of the maintenance rule. This safety consideration would be then used to determine if the SSC should be monitored at the system, train or plant level. The team reviewed the methods and calculations that PSE&G had established for making these safety determinations and the specific safety determinations made for some SSCs. The team also reviewed the expert panel's process and the information available which documented the decisions made by the expert panel.

b. Observations and Findings on Safety (Risk) Determinations, Risk Ranking, and Expert Panel

Expert Panel

Except for certain aspects of the risk ranking process, the team found the expert panel was performing its risk ranking function as described in NUMARC 93-01. The team noted that PSE&G had established additional responsibilities for the expert panel. These included approving scoping decisions, goals, performance criteria, and SSC categorizations, e.g., 10 CFR 50.65(a)(1) or (a)(2).

Documentation of expert panel decisions was contained in meeting minutes. Typically, the panel's decisions were documented, but the bases for these decisions was not provided. The expert panel has experienced significant personnel turnover since its inception. The team noted that the weak documentation for past decisions could make it difficult for the expert panel to evaluate proposed changes to the program. PSE&G agreed with this observation and stated that their corrective action and enhancement plan would assess and validate major program elements including the risk ranking process.

The team observed an expert panel meeting and judged that it performed its function well. The panel had a variety of experience and knowledge, and demonstrated knowledge of the requirements of the maintenance rule. There was substantive participation by all members. The panel had a questioning attitude.

Safety Determinations and Rankings

The maintenance rule requires that a determination be made as to the safety (risk) significance of each SSC that is in scope. A plant specific probabilistic risk assessment (PRA) was used to rank SSCs with regard to safety significance. PSE&G submitted to the NRC the Hope Creek Generating Station Individual Plant Examination (IPE) for internal events on May 31, 1994, in response to Generic Letter 88-20. The IPE (hereafter called the PRA) included Level 1 (internal events core damage frequency analysis) and Level 2 (containment performance analysis) sections.

The PRA estimated a core damage frequency (CDF) of 4.6E-5 events/reactor-year from internally initiated events, including the contribution from internal flooding. PSE&G subsequently revised the service water (SW) and safety auxiliaries cooling (SACS) system success criteria for the emergency diesel generators. The revised success criteria reduced the station blackout CDF from 3.4E-5 to 2.3E-6 events/year. This reduced the total internal CDF to 1.3E-5 events/year.

The Level 2 evaluation was not updated. Based on the original CDF of 4.6E-5 the conditional probability of early containment failure was 62% with drywell liner melt-through as the primary contributor. The conditional probability of late containment failure was 28%, primarily due to late over-temperature. The relatively large frequency and conditional probability of a large early release was driven by the

dominant contribution of the station blackout sequences to the original CDF. The revised SW/SACS success criteria has reduced this dominance and the frequency of both early and late containment failure was expected to decline.

The team reviewed the PRA truncation limits used during the risk ranking process and judged the limits to be reasonable. (Truncation limits are imposed on PRA models to limit the size and complexity of the PRA results to a manageable level.) PSE&G used a truncation level of 1E-10 when quantifying the PRA model. This was about five orders of magnitude less than the estimated internal CDF of 1.3E-5 events per year. The team judged this truncation level to be reasonable.

The PRA used generic data in conjunction with some plant specific information for initiating events, and component failure data. A Bayesian process was used to aggregate generic and plant-specific data. Plant specific test and maintenance data were used. PSE&G plans to update the Hope Creek PRA at least once every other refueling outage (i.e., approximately every three years) in accordance with programmatic standard NC.DE-PS.ZZ-0034(Q) Probabilistic Safety Assessment.

The safety significance determination process was the responsibility of the expert panel. The NUMARC 93-01 risk ranking recommendations for risk reduction worth (RRW) and risk achievement worth (RAW) were used. The PSE&G also used the 90% criterion for the core damage frequency cutset contribution as recommended by the NUMARC guidance.

Systems that satisfied any of the risk ranking criteria were retained by the expert panel as high safety significant with the exception of the circulating water pump room HVAC. The system was not modeled in detail in the PRA, and was approximated with a conservative screening value. Upon further evaluation PSE&G determined that the loss of HVAC did not cause an immediate failure, but rather a long term degradation due to high motor temperature.

Several SSCs that did not satisfy any of the NUMARC 93-01 guidance were upgraded to high safety significance, including;

- control complex Bailey modules
- primary containment structure
- secondary containment filter, recirculation and ventilation system (FRVS).

The expert panel determined that there were 27 high safety significant SSCs.

The team reviewed several SSCs and SSC functions considered to be low safety significant by the panel and agreed with the panel's safety significant determinations. The sample included the core spray system and the low pressure coolant injection (LPCI) function that provides vessel makeup. These systems were explicitly modeled in the Level 1 PRA.

Systems that support the operation of the major injection and decay heat removal systems were generally considered high safety significant. However, one important exception was noted. The Class 1E 480 VAC substation power and motor control centers were considered low safety significant. The team disagreed with these risk ranking decisions and this is part of the unresolved item identified below.

SSCs that are important in initiating events in the Hope Creek PRA were also reviewed by the team. These SSCs included the feedwater and condensate systems. The team observed that initiators were generally excluded from the risk ranking process. If initiators that have maintenance contributions had been considered, it is likely that feedwater and condensate would have been considered high safety significant.

The team noted a limitation in the expert panel's review of SSCs that were not explicitly modeled in the Level 1 PRA. The PRA included several important room over-temperature and internal flooding sequences that took credit for timely operator intervention. Room flooding level instrumentation and room over-temperature alarms provided important information and were implicitly credited in these operator actions. Although PSE&G excluded operator actions, SSCs that supported these actions should have been considered in the risk ranking process. PSE&G personnel concurred with this observation and agreed to consider initiating events that could have a maintenance contribution and SSCs that support operator actions as part of their revised risk ranking process.

PSE&G revised the safety auxiliary cooling and service water system success criteria for emergency diesel generator cooling. The Level 1 PRA was requantified resulting in a significant CDF reduction for the station blackout sequences. Although risk ranking (based on the Level 1 CDF) was redone, the potential effect on the Level 2 PRA was not assessed.

The importance of the containment isolation system and selected containment isolation valves would not be identified in a risk ranking process based on core damage frequency. The team could not find adequate information to justify placing these SSCs in the low safety significant category.

The team also noted that the fission product barriers should be classified as high safety significant SSCs.

c. Conclusions on Safety (Risk) Determinations, Safety (Risk) Ranking, and Expert Panel

The team concluded that the current expert panel was functioning well, however, a number of weaknesses were noted in the safety significance determinations made by an earlier panel. The decision to expand the role of the panel beyond that described in NUMARC 93-01 was a good initiative. Improved documentation would provide a better understanding of the bases for safety significance determinations for use in any future reevaluations.

The team concluded that the PSE&G approach to establishing SSC safety importance from the Level 1 PRA was acceptable. However, some weaknesses were noted in the treatment of initiating events and for SSCs that were not addressed by the PRA importance measures. The team concluded that the expert panel had not sufficiantly considered the limitations and boundaries of the Level 1 PRA in their safety significance determination of some SSCs.

The team disagreed with the classification of several SSCs and could not find sufficiant justificantion for placing the following SSCs in the low safety significant category:

- containment isolation
- feedwater
- condensate
- 480 VAC Class 1E power
- Class 1E motor control centers (MCCs)
- instrumentation for temperature and flooding level for various rooms

This issue will be carried as an unresolved item, pending NRC review of additional information justifying the basis for the low safety significance determinations. **(URI 50-354/97-80-03)**

M1.3 Goal Setting and Monitoring (a)(1) and Preventive Maintenance (a)(2) (IP 62706)

a. Inspection Scope

The team reviewed program documents in order to evaluate the process established to set goals and monitor under (a)(1) and to verify that the established performance criteria and preventive maintenance were effective under (a)(2) of the maintenance rule. The team also discussed the program with appropriate plant personnel. The team performed detailed programmatic reviews of maintenance rule implementation for the following SSCs:

(a)(1) SSCs

- standby liquid control
- service water
- safety & turbine auxiliary cooling
- emergency diesel generators
- 250 volts direct current (VDC) Class 1E
- control complex

(a)(2) SSCs

- digital feedwater control
- main turbine control oil
- structures

The team reviewed each of these systems to verify that goals or performance criteria were established in accordance with safety, that industry-wide operation experience was taken into consideration, that appropriate monitoring and trending were being performed, and that corrective actions were taken when a SSC failed to meet its goal or performance criteria or experienced a preventable system function failure (PSFF). The team also reviewed goals and performance criteria for SSCs not listed above.

b. Observations and Findings

Goal Setting and Performance Criteria (General)

The unavailability performance criteria dated January 8, 1997 were reviewed by the team, compared with the corresponding PRA values for selected SSCs, and found to be acceptable. The PRA model used plant specific values from the period of 1987 to the middle of 1993 for test and maintenance unavailability. The maintenance rule unavailability performance criteria considered PRA assumptions, technical specifications, and expert panel judgement.

The team noted that the maintenance rule unavailability performance criteria were generally less conservative (higher values) than the values assumed in the PRA. PSE&G performed a sensitivity study to assess the impact of the unavailability performance criteria. The base case CDF, using the PRA unavailability assumptions, was 1.5E-5 events per year. The sensitivity study used the maintenance rule unavailability values and resulted in an approximately 20% increase in CDF to 1.8E-5 events per year. Based on this small increase, the team determined that the unavailability performance criteria established for the maintenance rule were acceptable.

Problems existed with reliability performance criteria. The criteria were based upon the number of preventable system functional failures (PSFFs) per 18 month cycle. The number of PSFFs allowed per system/train was defined in the Hope Creek performance criteria dated January 8, 1997. PSE&G guidance did not consider safety when establishing the number of PSFFs to use as a reliability measure. The team noted that PSE&G had started to reevaluate their reliability performance criteria (AR 00970222087) to ensure that the performance criteria maintained the PRA assumptions.

The team noted that the high pressure coolant injection (HPCI) reliability performance criteria was given as two functional failures per cycle while the basis document stated only one failure per cycle had been chosen. The team also noted that PSE&G had an action item to review all performance criteria and this type of inconsistency should be identified during this review.

The team noted that the main steam non-ADS valves were high safety significant but they did not have reliability performance criteria established.

The team also noted that several high safety significant SSCs did not have unavailability performance criteria established. These SSCs included:

- nuclear boiler and reactor recirculation
- control rod drive
- auxiliary building HVAC - diesel generator area
- service compressed air
- instrument (control) air
- reactor protection
- control complex

In addition, the following standby SSCs were noted that did not have performance criteria at the system/train level:

- main turbine control oil (two standby functions)
- reactor manual control
- remote shutdown

(PSE&G had identified some of the above SSCs in their self assessment, but had not completed actions to include the SSCs in the maintenance rule program.)

Failure to establish acceptable unavailability and reliability performance criteria for high safety significant and standby SSCs which are commensurate with safety is an apparent violation of 10 CFR 50.65. **(VIO 50-354/97-80-04)**

Detailed Review of (a)(1) and (a)(2) SSCs

The team reviewed the implementation of the maintenance rule to individual (a)(1) and (a)(2) SSCs. Findings from this review are discussed below.

Six of the nine SSCs reviewed by the team had problems in the implementation of the maintenance rule. Problem areas included scoping, system boundary definition, setting goals and performance criteria. The team risk ranking for these SSCs was acceptable.

The interface between the digital and mechanical portion of the feedwater regulating valves was not defined. The team noted that the two affected system managers had worked out an informal process to control this interface.

As implemented by the system manager, the control complex system boundary included the cabinets that house over 5,200 Bailey 862 Digital Logic, Bailey 7000 Analog, and Bailey 890 Optic Isolation modules. These cabinets also contained auctioneered power supplies and relays. The Bailey modules were excluded from the system boundary of the control complex and contained no system designation. The Bailey modules were within the system boundary of each system that they control or trip, such as core spray. This description of the system boundary for the control complex was contrary to the written documentation given to the inspection team. The high safety significant function of the control complex was to maintain the power supply and optic isolation for the Bailey 7000 Analog 1E safety related

control room indication and alarm or trip inputs to the 1E digital system. The 5,200 Bailey modules were monitored as a group but the functional failures were attributed to the systems that can not perform their function and were not attributed to the control complex. This implementation of the monitoring and trending was confusing with regards to the system boundaries. At the time of the inspection PSE&G was developing a plan to monitor the Bailey modules on a component level for the maintenance rule. There were no goals to take the system out of the (a)(1) category. In addition, this high safety significant system did not have unavailability performance criteria established. Also, the reliability performance criteria that was established was not commensurate with safety.

The standby liquid control system consisted of the high safety significant function of injecting a neutron absorber solution, sodium pentaborate, into the reactor vessel to shutdown the reactor and maintain it subcritical during cooldown should the control rods become inoperable and fail to fully insert. Another function included in the scope was to provide containment isolation. PSE&G did not include the function to provide a source of high pressure injection of coolant into the reactor during an emergency which requires coolant level control per the emergency operating procedures. This was previously noted in the scoping section of this inspection report.

The main turbine control oil system function (high safety significant) was to position the turbine bypass valves to maintain the reactor pressure within limits and avoid unacceptably large power transient. Two standby functions were to provide overspeed protection and to protect the main turbine by tripping upon receipt of a valid trip signal. PSE&G had misidentified these two functions as operate mode instead of standby mode. PSE&G had self-identified the problem but had not completed corrective actions. The reliability performance criteria was one failure per cycle for all turbine bypass valves. There was no basis to evaluate whether the reliability was commensurate with safety. There were no unavailability or reliability performance criteria for the standby functions of this system. PSE&G was aware of this problem before the inspection.

The team reviewed the procedure for monitoring structures under the maintenance rule. The performance of structures cannot be monitored at the system or train availability or reliability level because they are passive. Instead, a preventive maintenance program consisting of condition monitoring and repair or mitigation of degradation provides assurance of the capability of the structures. The team determined the procedure specified detailed condition monitoring requirements for structures. However, the team also determined that there was no clearly defined process for placing degraded structures into the (a)(1) category before a functional failure occurs. The performance criteria specifying a functional failure of a structure to occur before placing a structure into (a)(1) category was an inappropriately high threshold. This issue of placing structures in (a)(1) is a generic issue in the industry and is an Inspector Follow Item. **(IFI 50-354/97-80-05)**

Adequate reliability and unavailability performance criteria had not been established for the service compressed air system and was identified as part of an apparent violation on performance criteria.

The team determined that the system managers were experienced and knowledgeable regarding their system's operation and maintenance requirements. Industry operating experience (IOE) was factored into both the performance criteria and the preventive maintenance program. However, it was not clear to the team that the IOE review group was effectively transmitting the results of their reviews to the appropriate system manager, as several managers indicated that their data generally came from other sources.

The team did not find significant problems in the corrective action programs for the (a)(1) systems reviewed.

c. Conclusions for Goal Setting and Performance Criteria

An apparent violation of the maintenance rule relating to establishing performance criteria and goals was identified by the team. This violation included three parts:

(1) unavailability and reliability performance criteria were not established for all high safety significant SSCs;
(2) performance criteria which were monitored at the train/system level were not established for all standby SSCs; and
(3) in a number of cases, reliability performance criteria were set at a level not commensurate with safety.

PSE&G had identified some of the inadequate performance criteria in their self assessment, however, had not corrected the problems.

Where PSE&G had established an unavailability performance criteria for a SSC, the team concluded that the performance criteria were consistent with safety and satisfactory.

The team found that industry-wide operating experience had been incorporated into the maintenance program by the system managers when setting goals and performance criteria and monitoring performance.

Six of the nine SSCs reviewed in detail by the team had problems in the areas of scoping, system boundary definition and establishing performance criteria. The team concluded that this was a strong indicator of a weak program.

M1.4 Plant Safety Assessments before taking Equipment Out of Service (IP 62706)

a. Inspection Scope

Paragraph (a)(3) of the rule states that the total impact on plant safety should be taken into account before taking equipment out of service for monitoring or preventive maintenance.

The team reviewed PSE&G's procedures for the control and implementation of on-line maintenance, as it related to the maintenance rule. The review included the safety assessment methodology used to evaluate the risk of taking equipment out of service during power operation and shutdown conditions. The team interviewed several licensed operators to assess their knowledge of and responsibilities for maintenance rule activities.

b. Observations and Findings

The team found that the procedures governing on-line maintenance provided PSE&G personnel with adequate guidance for the conduct of on-line maintenance. The risk-based configuration management for planning maintenance was based on risk matrices, which were graphical representations of 58 various system or component outage combinations and their corresponding instantaneous risk. Matrices were developed for both two and three system or component combinations. The risk matrix manual also included a listing of other prohibited combinations and potential compensatory actions required for higher risk maintenance. A nominal 72 hour outage was assumed, and for technical specification (TS) systems where work would exceed 50 per cent of the allowed outage time, additional review and approval was required.

The risk matrices generally addressed high safety significant systems and components. However, the team noted that some high safety significant systems and components were not included (e.g., main steam, turbine control). These were chiefly those not well modeled in the plant PRA. PSE&G indicated that they were considering adding these systems and components when the PRA and risk matrices were updated. The risk matrices did not address systems or components classified as low safety significant. The team noted that the cumulative effect of several simultaneous low safety significant system outages, alone or in combination with high safety significant systems or components outages, could result in a plant configuration with less than desired safety margin.

The matrices considered surveillance testing if the system or train was rendered inoperable. An independent surveillance testing schedule was used to avoid undesired plant challenges, however, certain surveillances could result in spurious main steam isolation valve closure or reactor scram. The matrices did not consider these kinds of potential initiators.

The team noted that while the PRA group provided safety assessment support for longer outages and emergent work, maintenance and operations personnel generally referred to the risk matrices for the majority of their risk assessments. PSE&G personnel interviewed by the team indicated they had no hesitation in calling on the PRA group when work would be outside the scope of a risk matrix or procedure. The team noted that operations and maintenance personnel were very familiar with the matrices, and that the long range planning reviews (greater than four weeks prior to the work week) were thorough and rigorous, compensating for some of the weaknesses, such as the failure to include all the high safety significant systems and components in the matrices discussed above.

The team reviewed the process used to manage risk during shutdown conditions. Procedure HC.OM-AP.ZZ-055(Q), "Outage Risk Management", was used for plant configuration control in Operating Modes 3, 4, and 5. In conjunction with the outage risk assessment and management (ORAM) computer software program, good guidance was provided for minimizing risk. However, it was not clear to the team or PSE&G personnel interviewed that risk assessment methods encompassed all operating modes. Maintenance during Mode 2 (Startup) did not appear to have been addressed. Planning and scheduling personnel indicated that it was not normal practice to schedule work while in this operating mode. The process for risk assessments when taking equipment out of service in mode 2 will be reviewed in a future inspection. **(IFI 50-354/97-80-06)**

The team interviewed some senior reactor operators (SROs) licensed personnel to assess their depth of knowledge of the maintenance rule and their responsibilities regarding risk management and on-line maintenance. Procedure SE.MR.HC.01, "Maintenance Rule System Function and Risk Significance Guide", provided very good guidance for operators to assess risk and make appropriate decisions concerning potential out-of-service equipment. Substantive training was provided by the maintenance rule coordinator during the first training cycle of 1997. The training included an in-depth overview of the maintenance rule and a review of the requirements and duties of the SROs regarding risk assessment and the identification of system functional failures. The team noted that the SROs thoroughly understood the use of their risk matrix guides and were aware that some systems and surveillances were not included. The SROs demonstrated a good questioning attitude in their approach to evaluating the risk of surveillance testing on-line.

The team noted that there was a high corrective maintenance backlog and actual time to complete maintenance was often longer than the scheduled time. Maintenance schedule adherence was followed on a weekly rather than daily basis. PSE&G informed the team that they were aware of this performance and had initiated investigations into their causes.

c. Conclusions

The team found that PSE&G had procedures in place to effectively control on-line maintenance with respect to risk evaluation. There were several areas where enhancements could be made in their program, and PSE&G was addressing these issues.

The team concluded that the SROs thoroughly understood the use of their risk matrix guides and were aware that some systems and surveillances were not included. The SROs also demonstrated a questioning attitude in their approach to evaluating the risk of surveillance testing on-line. The team concluded that the SROs had an understanding of the maintenance rule and their responsibilities under the rule.

M1.5 (a)(3) Periodic Evaluations and Balancing Reliability and Availability (IP 62706)

a. Inspection Scope

Paragraph (a)(3) of the rule requires that performance and condition monitoring activities and associated goals and preventive maintenance activities be evaluated, taking into account where practical, industry-wide operating experience. This evaluation is required to be performed at least one time during each refueling cycle, not to exceed 24 months between evaluations. The rule requires that adjustments be made where necessary to assure that the objective of preventing failures through the performance of preventive maintenance is appropriately balanced against the objective of minimizing unavailability due to monitoring or preventive maintenance.

The team reviewed the procedural guidelines for these evaluations, since no periodic evaluation or balancing had been performed.

b. Observations and Findings

The team reviewed PSE&G's desk top guide for conducting the periodic maintenance effectiveness assessment. The assessment will be conducted by a multi-disciplined review group especially formed for this purpose. The desk top guide covered the topics for review defined in the rule and described in NUMARC 93-01, including balancing reliability and availability of high safety significant SSCs.

c. Conclusions

The team concluded that the guidance developed by PSE&G should allow the facility to perform an acceptable periodic evaluation. Adequate guidance was also provided to balance reliability and availability of high safety significant SSCs.

**M2 Engineering Support of Facilities and Equipment**

E2.3 Review of updated Final Safety Analysis Report Commitments

A recent discovery of a licensee operating their facility in a manner contrary to the updated final safety analysis report (FSAR) description highlighted the need for a special focused review that compares plant practices, procedures and/or parameters to the FSAR descriptions. While conducting a plant walk down of the 250 VDC safety related battery systems, the team noted the system was operating at 270 VDC, which is in accordance with procedure HC.MD-CM.PJ-0001 (Q) Rev. 5, step 5.8.2 that requires the systems to operate at a setting of 264-270 VDC. However, FSAR section 8.3.2.1.2.1 states the system operates at 260 VDC during normal plant operation. These battery systems provide electrical power to the HPCI and the RCIC (reactor core isolation cooling system.

The potential impact of operating the 250 VDC battery systems at higher voltage than specified in the FSAR and the inconsistency of operation with the FSAR is a Unresolved Item. **(URI 50-354/97-80-07)**

## M3 Staff Knowledge and Performance

### M3.1 Knowledge of the Maintenance Rule

a. Inspection Scope

The team interviewed engineers and managers to assess their understanding of the maintenance rule and associated responsibilities.

b. Observations and Findings

System managers were knowledgeable of their systems and were familiar with related industry operating experience. They were also familiar with the maintenance rule requirements. In addition, the engineers demonstrated a very good knowledge of the system during an in plant walk down. The team also noted that the system managers were cognizant of their system's performance through the tracking and trending programs.

c. Conclusions

The team found that system managers were knowledgeable of their systems and the maintenance rule.

## M7 Quality Assurance (QA) in Maintenance Activities

### M7.1 Self-Assessments of the Maintenance Rule Program

a. Inspection Scope

The team reviewed six assessments which were conducted to determine if the maintenance rule was properly implemented.

b. Observations and Findings

The team found the assessments were generally in-depth and provided good feedback for maintenance rule program improvements. The issues that were identified in the reports appeared to be acted upon by the facility.

The team found the assessment dated February 1997, was not clearly written; however, the associated corrective action and enhancement plan was very thorough. The action plan covered all aspects of the maintenance rule program.

c. Conclusions

The team concluded that PSE&G had conducted numerous maintenance rule program assessments and had addressed issues identified in the assessments. The latest assessment and associated action plan covered all aspects of the rule. The team concluded that when the actions are successfully completed the maintenance rule program at Hope Creek should be greatly enhanced. These actions will be inspected in a future inspection. **(IFI 50-354/97-80-08)**

## V. MANAGEMENT MEETINGS

### XI. Exit Meeting Summary

The team discussed the progress of the inspection with PSE&G representatives on a daily basis and presented the inspection results to members of management at the conclusion of the inspection on February 28, 1997.

The team asked whether any materials examined during the inspection should be considered proprietary. PSE&G indicated that no information provided to the team was considered proprietary.

## PARTIAL LIST OF PERSONS CONTACTED

Public Service Electric & Gas

M. Bezilla, General Manager
D. Crouch, Maintenance Manager
J. Defebo, Supervisor Quality Assessment
A. Fakhar, Manager Specialty Engineering
M. Headrick, Superintendent, Hope Creek Planning
R. Linthicum, Maintenance Rule Program Manager
W. Mattingly, Supervisor Safety Review Group
M. Phillips, Supervisor PSA
J. Pollock, Manager QA NBG
G. Salamon, Supervisor Salem Licensing
D. Smith, Supervisor Hope Creek Licensing
D. Strong, Supervisor Component/Performance Monitoring

## LIST OF INSPECTION PROCEDURES USED

IP 62706 Maintenance Rule

## LIST OF ITEMS OPENED AND CLOSED

VIO 50-354/97-80-01 (EEI) Failure to include SSCs within scope of the maintenance rule program.

URI 50-354/97-80-02 Adequacy of operational procedures for the BISIS system.

URI 50-354/97-80-03 Review bases for determination of low safety significance for several SSCS.

VIO 50-354/97-80-04 (EEI) Failure to establish acceptable performance criteria for several high safety significant and standby SSCs.

IFI 50-354/97-80-05 Review the process for placing structures in (a)(1)

IFI 50-354/97-80-06 Review the process for risk assessments when taking equipment out of service in mode 2.

URI 50-354/97-80-07 Review the assessment of operating the 250 VDC battery system at higher voltages than specified in the FSAR.

IFI 50-354/97-80-08 Review completed actions by PSE&G to upgrade their maintenance rule program.

## LIST OF ACRONYMS USED

| | |
|---|---|
| ADS | Automatic Depressurization System |
| AR | Action Request |
| BISIS | Bypassed and Inoperable Status Indicating System |
| CDF | Core Damage Frequency |
| CFR | Code of Federal Regulations |
| CRD | Control Rod Drive |
| CST | Condensate Storage Tank |
| EEI | Edison Electric Institute |
| FRVS | Filter Recirculation and Ventilation System |
| FSAR | Final Safety Analysis Report |
| HPCI | High Pressure Coolant Injection |
| HVAC | Heating Ventilation and Air Conditioning |
| IEEE | Institute of Electrical and Electronics Engineers |
| IOE | Industry Operating Experience |
| MCC | Motor Control Center |
| NRC | Nuclear Regulatory Commission |
| NRR | Nuclear Reactor Regulation |
| NUMARC | Nuclear Management and Resources Council |
| PRA | Probalistic Risk Assessment |
| PSA | Probalistic Safety Assessment |
| PSE&G | Public Service Electric & Gas Company |
| PSFF | Preventable System Function Failure |
| QA | Quality Assurance |
| RAC | Reactor Auxiliary Cooling |
| RAW | Risk Achievement Worth |
| RCIC | Reactor Core Isolation Cooling |
| RRW | Risk Reduction Worth |
| SACS | Safety Auxiliaries Cooling System |
| SRO | Senior Reactor Operator |
| SSC | Systems, Structures, and Components |
| SW | Service Water |
| TS | Technical Specification |
| VDC | Volts Direct Current |